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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,196	02/18/2004	Gerard Francis McLean	1134.15A	1748

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EXAMINER	
CHUO, TONY SHENG HSIANG	
ART UNIT	**PAPER NUMBER**
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/781,196	MCLEAN ET AL.	
	Examiner	Art Unit	
	Tony Chuo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-31* is/are pending in the application.

4a) Of the above claim(s) *19-28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-18 and 29-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Claims 1, 2, and 4-31 are currently pending. Claims 19-28 are withdrawn from further consideration as being drawn to a non-elected invention. Claim 3 has been cancelled. New claim 31 has been added. The previous objection to the specification is withdrawn. The previous objection to claim 3 is withdrawn. The amended claims do not overcome the previously stated 103 rejections. Therefore, claims 1, 2, 4-18, and 29-31 stand rejected under the following 103 rejections.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-2, 5-7, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865).

The Okaniwa reference discloses a cross-linked polyelectrolyte that is produced by polymerizing a monomer in the presence of a proton conductive polymer that has a sulfonic group and a carboxylic acid group for use in a primary battery, secondary battery, or fuel cells (See Abstract and paragraph [0008]). In addition, it also discloses

a polymerization solvent that is dimethylacetamide (See paragraph [0077]). Examiner's note: It is well know in the art that a fuel cell comprises a first electrode, a second electrode, and a electrolyte membrane in between the first and second electrodes.

However, Okaniwa et al does not expressly teach a first vinyl monomer comprising a COOH group, a cross linking agent comprising a second vinyl monomer, and a photo-initiator. The Singleton reference discloses a polymer membrane comprising: a first polymeric material as a support; a second polymeric material comprising a vinyl monomer that includes carboxylic acid; a crosslinking agent that is divinylbenzene, and a photo-initiator (See column 5, lines 19-39 and column 6, lines 51-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa electrolyte to include a first vinyl monomer comprising a COOH group, a cross linking agent comprising a second vinyl monomer, and a photo-initiator in order to wet the electrolyte more quickly and more thoroughly so that the resistance to ionic migration through the membrane becomes stable quickly and at an advantageously low value.

Examiner's note: It is noted that claims 29-30 are construed as product-by-process claims and that the product itself does not depend on the process of making it. Accordingly, in a product-by-process claim, the patentability of a product does not depend on its method of production. Therefore, it has been held similar products claimed in product-by-process limitations are obvious (*In re Fessman* 180 USPQ 324 (CCPA 1974)).

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Linder et al (US 5599506). However, Okaniwa et al as modified by Singleton et al does not expressly teach a cross linking agent comprising di-vinyl sulphone. The Linder reference discloses a gel membrane where di-vinyl sulphone is used as the cross linking agent in the polymerization (See column 7, lines 20-27). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton electrolyte to include a cross linking agent that is di-vinyl sulphone in order to form a mechanically strong gel membrane with the proper porosity for ionic conductivity.

5. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Nam et al (US 2003/0219640). However, Okaniwa et al as modified by Singleton et al does not expressly teach a curable liquid electrolyte comprising a protonic polymer that is sulphonated polyether ether ketone and an elasticizing agent that is acrylonitrile. The Nam reference discloses a proton conducting polymer membrane comprising a protonic polymer that is sulphonated polyether ether ketone and an elasticizing agent that is acrylonitrile (See paragraphs [0019],[0020]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton electrolyte to include a protonic polymer that is sulphonated polyether ether ketone and an elasticizing agent that is

acrylonitrile in order to improve membrane conductivity, flexibility, water remaining ability, dimensional stability, and adhesion bonding ability.

6. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Puffer et al (US 3403054).

However, Okaniwa et al as modified by Singleton et al does not expressly teach first and second spacers connected to the first and second electrodes wherein the curable liquid electrolyte is disposed between the first and second spacers and an injection port disposed between the first and second electrode forming a cavity wherein the curable liquid electrolyte is disposed in the cavity; a porous substrate; at least one channel disposed in the porous substrate having a first channel wall and a second channel wall wherein the first electrode is disposed in the first channel wall and the second electrode is disposed in the second channel wall, and the curable liquid electrolyte is disposed in the channel.

The Puffer reference discloses first and second spacers "16a" & "16b" connected to the first and second electrodes "19" wherein the electrolyte is disposed between the first and second spacers and an injection port "18" disposed between the first and second electrode forming a cavity wherein the electrolyte is disposed in the cavity "17" (See Figure 1). Examiner's note: The ion exchange membrane system "16" is a substrate that includes a channel "17" with first and second channel walls "16a" & "16b" where the curable liquid electrolyte is disposed in the channel and the first electrode "19" is disposed in the first channel wall and the second electrode is disposed in the

second channel wall. In addition, it is implicit from the teaching of Puffer et al that the substrate is porous because otherwise the ion exchange membrane would not function to transport ions from one electrode to the other electrode.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton fuel cell to include first and second spacers connected to the first and second electrodes wherein the curable liquid electrolyte is disposed between the first and second spacers and an injection port disposed between the first and second electrode forming a cavity wherein the curable liquid electrolyte is disposed in the cavity; a porous substrate; at least one channel disposed in the porous substrate having a first channel wall and a second channel wall wherein the first electrode is disposed in the first channel wall and the second electrode is disposed in the second channel wall, and the curable liquid electrolyte is disposed in the channel in order to simplify the manufacturing of the fuel cell by utilizing a structure that is capable of injecting a liquid electrolyte in between the two electrodes.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054), and further in view of Fly et al (US 2002/0114990). However, Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a substrate that is a porous media. The Fly reference discloses a substrate that is a porous media (See paragraph [0017]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell to include a substrate that is a porous media in order to ensure an essentially uniform

distribution of gases through the channel in the porous media across the surface of the membrane electrode assembly.

8. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054) as applied to claim 13 above, and further in view of Mayer et al (US 6332990). However, Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a substrate that comprises a carbon filled epoxy, a carbon filled polymer, a manganelli phase titanium oxide, a foam, a monolith of porous material, an aerogel, a mat, a felt, a paper, a mesh, or laminates thereof. The Milliken reference discloses a substrate that is a carbon aerogel mixed with polymers (See column 3, lines 56-60). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell to include a substrate that is a carbon aerogel mixed with polymers in order to simplify the manufacturing of the substrate by allowing the precursor materials to be spread in thin films.

9. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054) as applied to claim 13 above, and further in view of Jones et al (US 5998054).

However, the Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a base comprising a distribution plenum for transporting curable liquid electrolyte, at least one fluid port in fluid communication with the channel, at least

one master port for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode.

The Jones reference discloses a base comprising a distribution plenum "134" for transporting curable liquid electrolyte, multiple fluid ports "131" in fluid communication with the channel, one master port "132" for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode (See Figure 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell to include a base comprising a distribution plenum for transporting curable liquid electrolyte, multiple fluid ports in fluid communication with the channel, one master port for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode in order to simultaneously inject the curable liquid electrolyte into multiple unit cells in the fuel cell stack.

Response to Arguments

10. Applicant's arguments filed 3/13/07 have been fully considered but they are not persuasive.

The applicant argues that the Okaniwa reference combined with the Singleton reference do not disclose a curable liquid electrolyte that can be cured in situ between two electrodes and which comprises the monomers as recited in claim 1. The examiner's would like to emphasize that in product-by-process claims, the patentability of a product does not depend on its method of production. Therefore, the limitation "the

membrane electrolyte formed by curing a liquid within the electrochemical cell" is not given patentable weight. Regardless of whether the electrolyte is cured inside the electrochemical cell or outside of the electrochemical cell, the final product is still a solid or gelled electrolyte. It is contended by the examiner that Okaniwa's proton conductive polymer with the sulfonic acid group, mixed with Singleton's solution of acrylic acid, crosslinking agent, photoinitiator, and water will form a curable liquid electrolyte. It is noted that Singleton teaches irradiating the vinyl monomer solution to cure the liquid electrolyte. This teaching further supports the contention that Okaniwa's polymer modified by Singleton's monomer solution will form a liquid electrolyte that is curable.

The applicant also argues that the references teach away from the claimed combination because combining the two would teach a cross linking or polymerization reaction that would need to take place on an inert porous polymeric matrix, as described by the Singleton reference. The Singleton reference does teach a cross-linking or polymerization reaction on an inert polymeric material that is used as a support. However, there is no evidence to show that Okaniwa's proton conductive polymer cannot be used as a support for the cross-linking or polymerization reaction taught by Singleton et al.

The applicant also argues that there is no suggestion or motivation to combine the elements because neither reference describes the in situ forming of a curable liquid electrolyte. The examiner would like to reemphasize that the curing of the liquid electrolyte in situ within the structure described in the applicant's claims is not given patentable weight. It is further noted that the motivation to combine the Okaniwa

reference with the Singleton reference is found the Singleton reference which is to form a membrane that can be wet more quickly and more thoroughly so that ionic migration through the membrane becomes stable quickly (See column 6, lines 51-64).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

JONATHAN CREPEAU
PRIMARY EXAMINER